

WHAT IS CLAIMED IS:

1. A process to desulfurize sulfur containing fuel gas used as feed fuel for fuel cell system comprising the steps:

(1) providing a main feed stream of sulfur containing fuel gas containing at least 0.30 ppm of odorous sulfur compounds; and then

(2) passing part of that main feed stream of sulfur containing fuel gas and compressing it to a pressure over 304 kPa; and then

(3) passing the compressed sulfur containing fuel gas to sulfur selective membrane, where the gas is separated into a sulfur concentrated stream, and a sulfur lean stream containing no more than 0.20 ppm of sulfur compounds; and then

(4) passing the sulfur concentrated stream back to the main feed stream down stream from where the stream of step (2) was provided; and then

(5) optionally measuring gas flow and reducing gas pressure; and then

(6) passing the sulfur lean stream through a sulfur sorbent medium to collect sulfur, providing an essentially sulfur free stream containing no more than 0.10 ppm of sulfur compounds; and

(7) optionally reforming the essentially sulfur free stream prior to passing it to contact a fuel cell.

2. The method of Claim 1, where the main feed stream is natural gas stream.

3. The method of Claim 1, where the main feed stream contains odorous sulfur compounds selected from the

group consisting of mercaptans, sulfides, and thiophenes and mixtures thereof.

4. The method of Claim 1, where the main feed stream is a natural gas stream containing odorous sulfur compounds selected from the group consisting of tertiary butyl mercaptan, dimethyl sulfide, tetrahydrothiophene and mixtures thereof.

5. The method of Claim 1, where the sulfur free stream is reformed in step (7).

6. The method of Claim 1, where the fuel cell is an axially elongated solid oxide fuel cell.

7. The method of Claim 1, where the fuel cell is contacted with a pressurized, essentially sulfur free stream in step (7).

8. The method of Claim 1, where gas flow is measured between steps (4) and (6).

9. The method of Claim 1, where the sulfur containing fuel gas passed to the sulfur selective membrane is at a pressure between 304 kPa and 20670 kPa.

10. The method of Claim 1, where the essentially sulfur free stream provided in step (6) contains between about 0.025 ppm and 0.075 ppm of sulfur compounds.

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